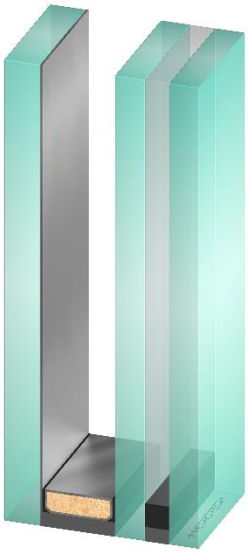
ENVIRONMENTAL PRODUCT DECLARATION

In accordance with EN 15804 and ISO 14025

CONTRAFLAM LITE 90 IGU

DGU: CFL90 (5/5) / 16Ar / 4T
DGU: CFL90 (5/5) / 16Ar / 44.2
DGU: CFL90 (5/5) / 12Ar / 6T
DGU: CFL90 (5/5) / 16Ar / 6A
TGU: CFL90 (5/5) / 12Ar / 6T / 12Ar / 6T
TGU: CFL90 (5/5) / 14Ar / 6T / 14Ar / 6T

EW 90 (Radiation Control): Fire resistant glazing with tested radiation control and heat insulation for 90 minutes



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Publication date:	**2019-12-17**
Valid until:	**2024-12-17**

EPD VERIFIED

EPD®

EPD Registration number
S-P-01739

vetrotech SAINT-GOBAIN

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Programme information

Programme	The International EPD® System EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden More information at www.environdec.com
EPD® registration number	S-P-01739
Programme category rules (PCR)	EN 15804 as the core PCR and PCR for construction products and construction services issued by the International EPD System (PCR 2012:01 Construction products and construction services, version 2.3 2018-11-15)
CPC Classification	37115 “safety glass”
PCR review was conducted by	The Technical Committee of the International EPD® System. Contact via info@environdec.com
Owner of the declaration	VETROTECH SAINT-GOBAIN INTERNATIONAL AG Bernstrasse 43, 3175 Flamatt, Switzerland Maureen Bernard. Email: maureen.bernard@saint-gobain.com
Manufacturer	**Saint-Gobain Glass (United Kingdom) Limited,** Saint-Gobain House, Binley Business Park, Coventry, CV3 2TT **Vetrotech Saint-Gobain Kinon GmbH,** Jülicher Strasse 495, 52070 Aachen, Deutschland **Saint-Gobain Polska** Sp. z o.o., Vetrotech, Ul. Pilsudskiego 18, 46-100 Namyslow **Vetrotech Saint-Gobain Switzerland**, Z.I. La Maillarde, 1680 Romont
Independent third-party verification of the declaration and data, according to ISO 14025:2006	☐ EPD process certification ☒ EPD verification
EPD® prepared by	Elodie Ducourthial (Saint-Gobain Glass) Contact: Elodie.ducourthial@saint-gobain.com
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Approved by	The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier	☐ Yes ☒ No
Declaration issued	**2019-12-17**
Valid until	**2024-12-17**

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

An EPD should provide current information and may be updated if conditions change. The stated validity is, therefore, subject to the continued registration and publication at www.environdec.com.

Product description

Product description and description of use

The Environmental Product Declaration (EPD) describes the environmental impacts of 1m² of CONTRAFLAM LITE 90 IGU, which is a fire resistant laminated glass.

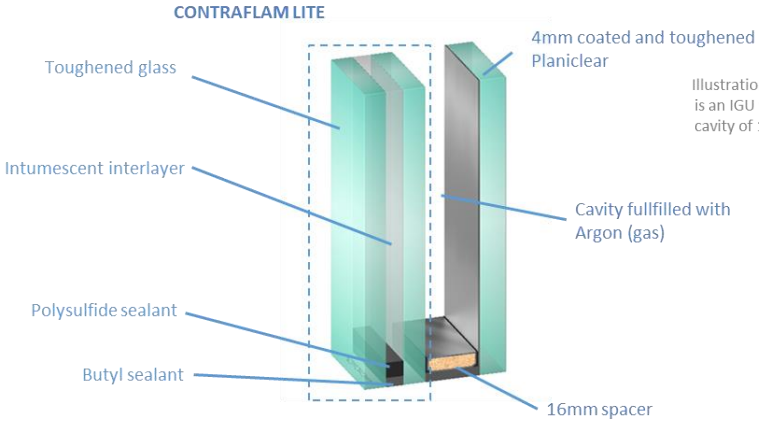


Illustration shows a **CONTRAFLAM LITE IGU** which is an IGU with a CONTRAFLAM LITE on one side, a cavity of 16mm and a 4mm coated and tempered glass. (configuration n°1)

SPECIFIC MAKE-UPS DESCRIBED IN THIS EPD

IGU (Insulated Glazing Unit) is a high performing insulated glazing unit, meant for building applications (facades, windows …). This IGU incorporate a low emissivity coating on one face, which gives it its high performing thermal properties. It complies with European standard EN 1279-5. On the other face it can be combine with other glazing like CONTRAFALM LITE.
An IGU can be double (DGU) with one cavity are a Triple (TGU) with two cavities. Cavities are closes by a spacer and polymer sealants. The cavity itself is fulfilled with argon gas to guaranty high insulating performances.
Description of a IGU is made with its geometry. For example, in the figure before, *CFL90 (5/5) / 16 Ar / 4T* is a DGU with a cavity thickness of 16mm with argon, and one glass is a CFL90, the other is a 4mm glass thoughened.

CONTRAFLAM LITE 90 IGU is a fire resistant and Insulating Glass Unit (IGU) for interior and exterior[1] applications: either as a Double Glazed Unit (DGU) or Triple Glazed Unit (TGU) according to European standard EN 1279. It will then be called CONTRAFLAM LITE 90 - DGU or CONTRAFLAM LITE 90 - TGU. The contained therein CONTRAFLAM LITE 90 fire resistant laminated glass in conformance with EN 14449 has EW90 integrity and radiation control properties according to European standard EN 13501-2. It consists of two sheets of toughened safety glass. The cavity between the sheets of glass is filled with a transparent intumescent interlayer. This enables the glass to react when exposed to radiant heat and fire in order to protect life and property in living places for the specific time frame. By adding a laminated safety glass including a PVB layer, fall-through protection in the event of breakage of the CONTRAFLAM unit can be included as an option.
CONTRAFLAM LITE 90 can also be used as monolithic fire resistant glass without an insulation glass unit and for internal application only. This type of glass is described in a separate EPD.

In this Environmental Product Declaration, one square meter of different glazing configurations will be analyzed:

1. CONTRAFLAM LITE 90 DGU: CFL90 (5/5) / 16 Argon / 4 Toughened[2]
2. CONTRAFLAM LITE 90 DGU: CFL90 (5/5) / 16 Argon / 44.2 Stadip[3]
3. CONTRAFLAM LITE 90 DGU: CFL90 (5/5) / 12 Argon / 6 Toughened

[1] With coating(s) on outer pane(s)
[2] Toughened : glass with thermal treatment
[3] Stadip: Laminated glass

4. CONTRAFLAM LITE 90 DGU: CFL90 (5/5) / 16 Argon / 6 Annealed[4]
5. CONTRAFLAM LITE 90 TGU: CFL90 (5/5) / 12 Argon / 6 Toughened / 12 Argon / 6 Toughened
6. CONTRAFLAM LITE 90 TGU: CFL90 (5/5) / 14 Argon / 6 Toughened / 14 Argon / 6 Toughened

CONTRAFLAM LITE Range

Products of the CONTRAFLAM LITE range are single fire-resistant glasses made of tempered safety glass and sealed to be completely moisture-resistant. The chamber is filled with a transparent and UV-stable alkaline silicate based chemical mixture which reacts in the event of fire. This intumescent interlayer expands as an opaque foam providing integrity (E) and radiation (W) properties for 30 to 120 minutes (according product) and reduces panic by blocking the view to affected areas.

[4] Annealed : glass without thermal treatment

PERFORMANCE DATA

The range of CONTRAFLAM LITE 90 IGU is very large and can be personalized according a wide range of multifunctional options.
Here are a few examples of configurations for each of the products described in this EPD.

Discover more information about the CONTRAFLAM LITE range on www.vetrotech.com.

In this Environmental Product Declaration, one square meter of 6 different glazing configurations will be analyzed:

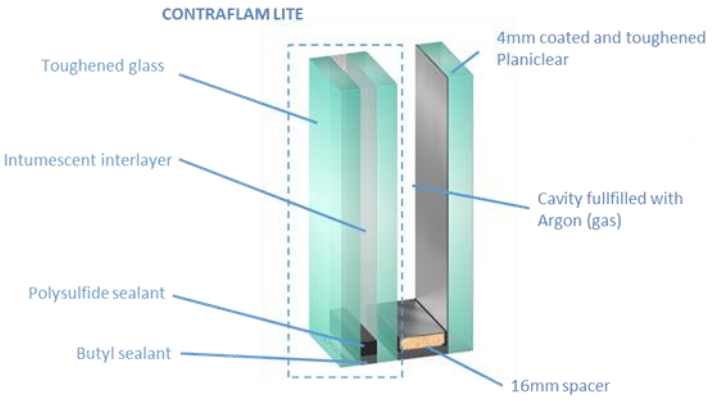
	N° 1	**N° 2**	**N° 3**	**N° 4**	**N° 5**	**N° 6**
	CFL 90 (5/5) CLIMAPLUS 4t-16 - CFL90	**CFL 90 (5/5) CLIMAPLUS 44.2-16 - CFL90**	**CFL 90 (5/5) CLIMAPLUS 6t-12 - CFL90**	**CFL 90 (5/5) CLIMAPLUS 6-16 - CFL90**	**CFL 90 (5/5) CLIMATOP 6t-12-6t-12 - CFL90**	**CFL 90 (5/5) CLIMATOP 6t-14-6t-14 - CFL90**
Coating	Planitherm XN II	Planitherm XN	Planitherm XN II	Planitherm XN	Planitherm XN II	Planitherm XN II
Mechanical properties						
Nominal thickness (mm)	34	39	32	36	50	54
Weight (kg/m^2)	41	52	46	46	61	61
Visible parameters						
Light transmittance (LT) %	79	78	79	79	71	71
Light reflection (RLe/RLi) (%)	12 / 12	12 / 12	12 / 12	12 / 12	15 / 14	15 / 14
Thermal transmission						
Ug value	1.1	1.1	1.2	1.1	0.7	0.6
Thermal properties						
Energy transmittance (ET) %	53	48	52	52	42	42
Energy reflection (Ree/Rei) %	27 / 16	21 / 15	26 / 16	26 / 16	30 / 19	30 / 19
Solar factor g	0.61	0.56	0.60	0.60	0.51	0.51
Safety properties						
Class EN 356 (protection against vandalism and burglary)	NPD[5]	P2A[6]	NPD	NPD	NPD	NPD
Acoustics properties						
Rw(C;Ctr) (real test)	NPD	NPD	38 (-3; -6) calculated	39 (-2; -5)	NPD	NPD

The performance data are given according to the EN 410-2011 standard for thermal and visible parameters and following the EN 12758 for the acoustic data. Fire performance data is determined according to EN13823, EN1363-1, EN1363-2 and associated test standards. Fire classification is following EN15998, EN13501-1 and EN13501-2.

[5] NPD: Not Declared Performances
[6] P2A: level of protection

Declaration of the main product components and/or materials

Illustration shows a **CONTRAFLAM LITE IGU** which is an IGU with a CONTRAFLAM LITE on one side, a cavity of 16mm and a 4mm coated and tempered glass. (configuration n°1)



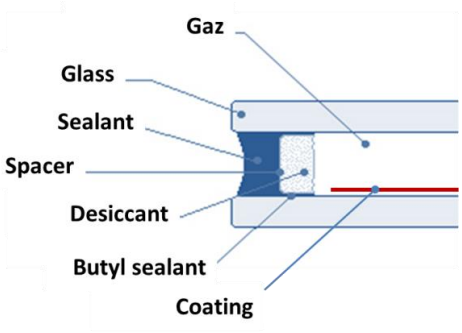


Illustration of **IGU** composition

	N° 1	N° 2	N° 3	N° 4	N° 5	N° 6	
MATERIAL COMPOSITION Weight (%)	**CFL 90 (5/5) CLIMAPLUS 4t-16 - CFL90**	**CFL 90 (5/5) CLIMAPLUS 44.2-16 - CFL90**	**CFL 90 (5/5) CLIMAPLUS 6t-12 - CFL90**	**CFL 90 (5/5) CLIMAPLUS 6-16 - CFL90**	**CFL 90 (5/5) CLIMATOP 6t-12-6t-12 - CFL90**	**CFL 90 (5/5) CLIMATOP 6t-14-6t-14 - CFL90**	**CAS number**
Glass	84	85	86	85	89	88	CAS number 65997-17-3, EINECS number 266-046-0
Fire resistant Interlayer	14	11	13	13	10	10	Confidential but no classified components inside
Coating	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	Polymer
Butyl sealant	0.4	0.3	0.3	0.3	0.3	0.3	Polymer
Sealant polysulfide	1.6	1.2	1.1	1.4	1.5	1.7	Metal Oxides, which bring thermal properties to the glazing
Spacer bar (aluminium or steel)	< 1	< 1	< 1	< 1	< 1	< 1	Article
Desiccant	< 1	< 1	< 1	< 1	< 1	< 1	CAS number 63148-65-2
Gaz	0.1	0.1	0.1	0.1	0.1	0.1	Dehydrated argon
PVB interlayer	no PVB	1.6	no PVB	no PVB	no PVB	no PVB	CAS number 63148-65-2 EINECS number 272-808-3

The above list gives the main components of the product, including those contributing to more than 5% of any environmental impact, if any. The percentages are given for the glass make-ups mentioned in this EPD; the % may vary depending on the glazing configuration.

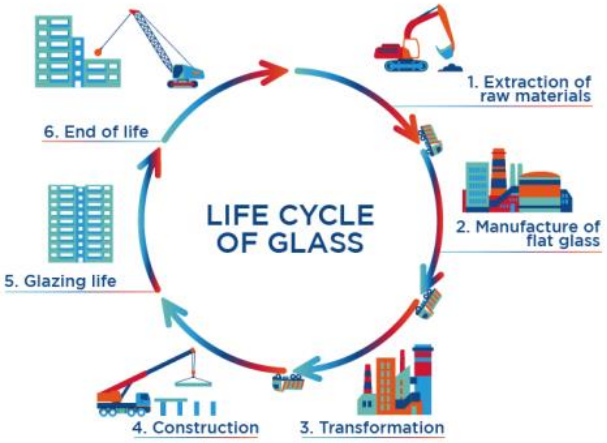
LCA calculation information

FUNCTIONAL UNIT / DECLARED UNIT	One square meter of CONTRAFLAM LITE 90 IGU to be incorporated into a building. The impacts of installation are not taken into account.
SYSTEM BOUNDARIES	Cradle to gate. Mandatory Stages = A1-A3
EXCLUDED LIFE CYCLE STAGES	Excluded stages = A4-A5; B1-B7; C1-C4 Optional stage = D
REFERENCE SERVICE LIFE (RSL)	n/a. Boundaries are cradle to gate
CUT-OFF RULES	All significant parameters shall be included. According to EN 15804, mass flows under 1% of the total mass input and/or energy flows representing less than 1% of the total primary energy usage of the associated unit process may be omitted. However, the total amount of energy and mass omitted must not exceed 5% per module. Substances of Very High Concern (SVHC), as defined in the REACH Regulation (article 57), in a concentration above 0.1% by weight, in glass final products, shall be included in the Life Cycle Inventory and the cut-off rules shall not apply. All inputs and outputs to the processes for which data is available were included in the calculation. No core processes were excluded. Particular care was taken to include materials and energy flows known to have the potential to cause significant emissions into air, water and soil related to the environmental indicators of the governing PCR.
ALLOCATIONS	No allocation. Attribution of total inputs and outputs are based on m² of production for Contraflam Lite IGU. Allocation of background data (energy and materials) taken from the GaBi 2016 databases is documented online at http://www.gabi-software.com/support/gabi/
GEOGRAPHICAL COVERAGE AND TIME PERIOD	Primary production data is from the year 2014 VETROTECH SAINT-GOBAIN Germany. The shares of the different production sites are from 2019.
BACKGROUND DATA SOURCE	GaBi data not older than 10 years were used to evaluate the environmental impacts.
SOFTWARE	Gabi 8 - GaBi envision The glass LCA model is based on an interactive GaBi tool which was verified separately in 2016. SGG_EPD tool for Building glass 1m2_2016-11-23.gmbx Initial tool was updated with most recent version data base (GaBi 8 service pack 36)

According to EN 15804, EPD of construction products may not be comparable if they do not comply with this standard. According to ISO 21930, EPD might not be comparable if they are from different programmes.
Reading note: In this document, the thousand separator and the decimal mark follow the International System; English version, *i.e* 1 234.56

Life cycle stages

Diagram of the Life Cycle



Relevant stages: as this is a cradle to gate the only relevant stages are A1-A3.

In conformity with EN 15804+A1, production step includes:

- Extraction and processing of raw materials;
- Generation of electricity, steam and heat from primary energy resources, also including their extraction, refining and transport;
- Transportation up to the factory gate and internal transport;
- Manufacturing of ancillary materials or pre-products;
- Manufacturing of product;
- Processing up to the end-of-waste state or disposal of final residues including any packaging not leaving the factory gate with the product.

All glasses are transported in specific trucks (inloaders), with returnable racks. Other components, like intumescent layer are delivered in drums, which are return to the supplier.

A description of the relevant stages is given in the figures below, two types of CONTRAFLAM LITE 90 IGU configurations are given in the Figure 1 .

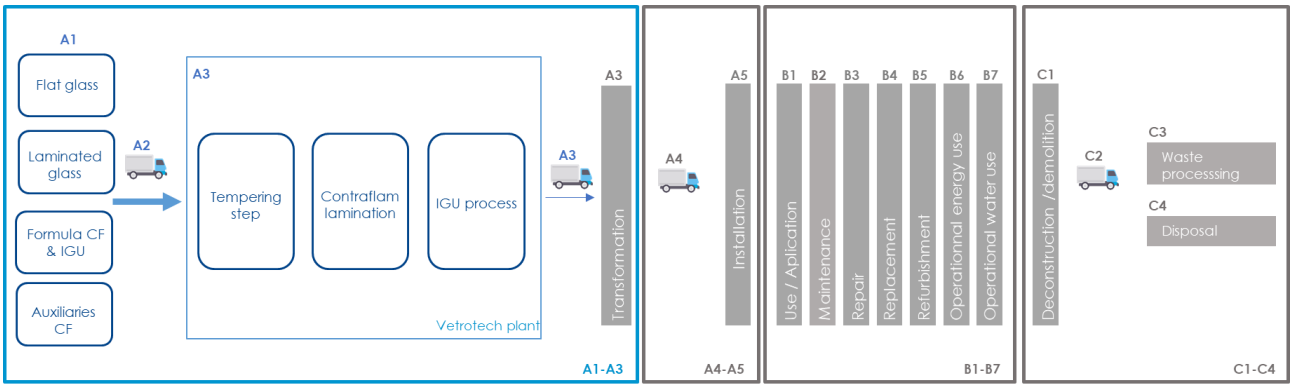


Figure 1 : Relevant LCA steps for Contraflam Lite. Steps in blue are declared in this EPD, steps in grey are not declared.

Production			Installation		Use phase							End-of-Life				Next product system
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C3	C3	C4	D
Raw materials (extraction, processing, recycled material)premières	Transport to manufacturer	Manufacturing	Transport to building site	Installation into building	Use / application	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport to EoL	Waste processing for reuse, recovery or recycling	Disposal	Reuse, recovery or recycling potential
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Table 1: Modules of the production life cycle included in the EPD (X = declared modules ; MND = modules not declared)

Product stage, A1-A3

Description of the stage: For CONTRAFLAM LITE 90 IGU, A1 to A3 represents the production of an IGU glass in the VETROTECH plant, based on the use of SGG PLANICLEAR, SGG STADIP and CONTRAFLAM LITE 90 with the transportation to the processing site.

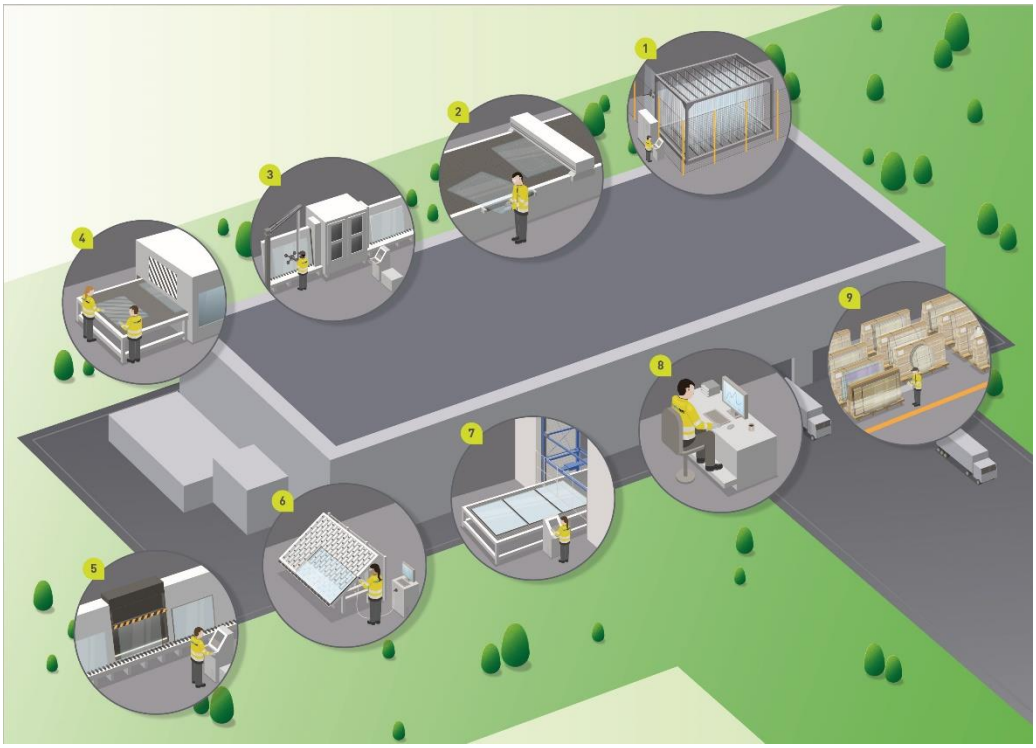
The product stage includes the extraction and processing of raw materials and energies, transport to the manufacturer, manufacturing and processing of CONTRAFLAM LITE 90 IGU glazing.
All glasses are transported in specific trucks (inloaders), with returnable racks. Other components, like intumescent layer are delivered in drums, which are return to the supplier.

Flat glass is a sheet of soda-lime glass made by floating molten glass on a bed of molten tin. This method gives the sheet uniform thickness and very flat surfaces.

Laminated glass is an assembly of two flat glasses and a PVB foil. To ensure the good adhesion between the glass and the film, the assembly is manufactured in an autoclave (at high pression and temperature).

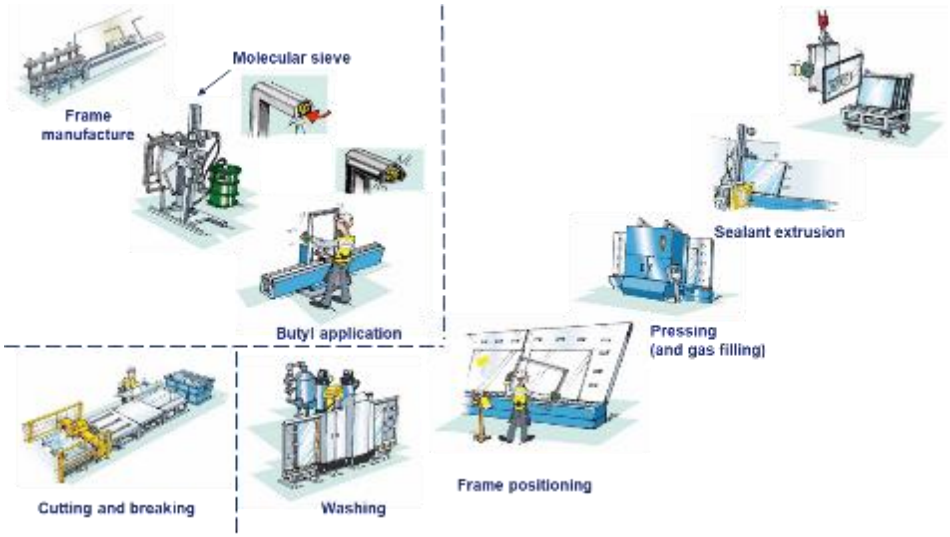
Coating magnetron transformation consists in a process where different materials are deposited on a flat glass surface under determined conditions so it gets different kind of properties that improve the energy efficiency of the glazings.

CONTRAFLAM manufacturing process flow diagram



1. **RECEPTION AND STORAGE**: Sheets of glass arrive from float glass plants by special transport inloaders and are stored in our plants.
2. **CUTTING**: The right sheet of glass is automatically taken from the glass storage and cut-to-size according the customer's requirements (cut to order).
3. **EDGE TREATMENT**: Glass edges are treated to the prescribed quality to prepare the next processing step.
4. **TEMPERING**: In general, all glasses are tempered to ensure the overall performance in terms of break resistance and accidental impact safety aspects. Of course we can supply every protective glass demanded within our product make-up.
5. **INSULATING GLASS UNIT (IGU) ASSEMBLY**: On a specially designed IGU processing-line, two pieces of glass are assembled together to create an inner chamber, made air and moisture tight by a primary and secondary sealant for maximum durability.
6. **INJECTION OF INTERLAYER**: The chamber is then filled in with an intumescent interlayer and filling holes are sealed.
7. **CURING OF INTERLAYER:** The injected interlayer is cured in a thermal treatment process to achieve transparency and hardness
8. **IGU PRODUCTION:** Once the counter-pane has been cut and edge-worked, it is first washed and dried to remove all dirty particles. The counter-pane and the CONTRAFLAM unit are separated by a metallic spacer bar. They are then sealed around the perimeter using organic seals, and the spacer bar is filled with desiccant to dry the air in the cavity. A secondary seal is then applied to hermetically seal the Double Glazing Unit. For a TGU, this process is repeated one more time.
9. **QUALITY CONTROL**: All glass units are inspected and checked to regulatory requirements and quality standards before being packed on stillages. That gives us the possibility to meet 100% of customer needs.
10. **STORAGE AND TRANSPORT**: All glass units are packed on stillages and dispatched to the final place of application.

Production of Insulated Glass Unit (IGU)



1. **GLASS PREPARATION:** Glass plates are cut to be at the good dimension for the final product. Glasses are cleaned and dried.
2. **PRODUCTION OF COMPONENTS:** In parallel the spacer is prepared. It arrives to the line as a several meters long bar. This bar is folded until the frame size of the glazing. The frame is filled with molecular sieve (desiccant) and then manually closed by a connector. The frame then passes between two injectors of butyl sealant which cover the entire edge.
3. **IGU PREPARATION:** The last step is to assemble the glasses and frame. The frame is positioned between the two glasses (positioning of the frame). The two glasses and the frame enter a chamber where they are assembled under pressure, and where the gas is injected into the cavity (pressure and injection of gas). After this operation, the secondary seal is applied around the double glazing (extrusion of the sealant). The glazing is then stored to allow crosslinking of the seal (conditioning).

Use of sustainable light bulbs, recycling of broken glass culets, recycling of cardboard, metal, timber and installation of pollution abatement systems and closed circuit management of water: every measure is taken to limit the consumption of energy, extraction of natural resources, production of waste and emissions into the atmosphere.

LCA results

The table below present the environmental impacts associated with the production of one square meter of CONTRAFLAM LITE 90 IGU. This is a Cradle-to-Gate EPD. The environmental impacts of all the other stages in the life cycle of CONTRAFLAM LITE 90 IGU are not declared (INA).

ENVIRONMENTAL IMPACTS CONTRAFLAM LITE 90 (5/5) IGU: 4 TG / 16 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	1.11E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas. carbon dioxide. which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	3.26E-5	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons). Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	3.94E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production. heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	9.48E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients. and the associated adverse biological effects.														
Photochemical ozone Creation Potential (POCP) *kg Ethene equiv/FU*	2.60E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil ressources (ADP-elements) - *kg Sb equiv/FU*	4.89E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil ressources (ADP-fossil fuels) - *MJ/FU*	1.24E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources. thereby lowering their availability for future generations.														

RESOURCE USE CONTRAFLAM LITE 90 (5/5) IGU: 4 TG / 16 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	2.43E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	2.43E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	1.41E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	1.41E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	4.01	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	5.04E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES CONTRAFLAM LITE 90 (5/5) IGU: 4 TG / 16 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	2.98E-3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	1.22E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	6.62E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS CONTRAFLAM LITE 90 (5/5) IGU: 4 TG / 16 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	1.15	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

ENVIRONMENTAL IMPACTS CONTRAFLAM LITE 90 (5/5) IGU: 44.2 Stadip / 16 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	1.24E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas. carbon dioxide. which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	3.26E-5	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons). Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	4.46E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production. heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	1.10E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients. and the associated adverse biological effects.														
Photochemical ozone Creation Potential (POCP) *kg Ethene equiv/FU*	2.95E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil ressources (ADP-elements) - *kg Sb equiv/FU*	5.64E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil ressources (ADP-fossil fuels) - *MJ/FU*	1.45E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources. thereby lowering their availability for future generations.														

RESOURCE USE CONTRAFLAM LITE 90 (5/5) IGU: 44.2 Stadip / 16 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	2.48E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	2.48E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	1.61E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	1.61E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	4.86	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	5.25E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES CONTRAFLAM LITE 90 (5/5) IGU: 44.2 Stadip / 16 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	2.98E-3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	1.12E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	6.65E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS CONTRAFLAM LITE 90 (5/5) IGU: 44.2 Stadip / 16 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	2.18	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

ENVIRONMENTAL IMPACTS CONTRAFLAM LITE 90 (5/5) IGU: 6 TG / 12 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	1.17E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas. carbon dioxide. which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	3.26E-5	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons). Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	4.25E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production. heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	1.05E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients. and the associated adverse biological effects.														
Photochemical ozone Creation Potential (POCP) *kg Ethene equiv/FU*	2.77E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil ressources (ADP-elements) - *kg Sb equiv/FU*	5.33E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil ressources (ADP-fossil fuels) - *MJ/FU*	1.30E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources. thereby lowering their availability for future generations.														

RESOURCE USE CONTRAFLAM LITE 90 (5/5) IGU: 6 TG / 12 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
 Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	2.43E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	2.43E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	1.47E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of non-renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	1.47E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of secondary material *kg/FU*	4.59	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of renewable secondary fuels- *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of non-renewable secondary fuels - *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of net fresh water - *m^3/FU*	5.12E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES CONTRAFLAM LITE 90 (5/5) IGU: 6 TG / 12 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	2.98E-3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	1.22E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	6.64E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS CONTRAFLAM LITE 90 (5/5) IGU: 6 TG / 12 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	1.30	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

ENVIRONMENTAL IMPACTS CONTRAFLAM LITE 90 (5/5) IGU: 6 PLC / 16 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	1.09E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas. carbon dioxide. which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	3.26E-5	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons). Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	4.02E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production. heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	9.85E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients. and the associated adverse biological effects.														
Photochemical ozone Creation Potential (POCP) *kg Ethene equiv/FU*	2.60E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil ressources (ADP-elements) - *kg Sb equiv/FU*	5.18E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil ressources (ADP-fossil fuels) - *MJ/FU*	1.24E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources. thereby lowering their availability for future generations.														

RESOURCE USE CONTRAFLAM LITE 90 (5/5) IGU: 6 PLC / 16 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	2.24E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	2.24E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	1.39E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	1.39E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	4.36	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	4.62E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES CONTRAFLAM LITE 90 (5/5) IGU: 6 PLC / 16 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	2.98E-3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	1.10E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	6.04E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS CONTRAFLAM LITE 90 (5/5) IGU: 6 PLC / 16 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	1.24	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

ENVIRONMENTAL IMPACTS CONTRAFLAM LITE 90 (5/5) IGU: 6 TG / 12 Argon / 6 TG / 12 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	1.53E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas. carbon dioxide. which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	3.26E-5	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons). Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	5.71E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production. heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	1.42E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients. and the associated adverse biological effects.														
Photochemical ozone Creation Potential (POCP) *kg Ethene equiv/FU*	3.69E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil ressources (ADP-elements) - *kg Sb equiv/FU*	7.66E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil ressources (ADP-fossil fuels) - *MJ/FU*	1.71E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources. thereby lowering their availability for future generations.														

RESOURCE USE CONTRAFLAM LITE 90 (5/5) IGU: 6 TG / 12 Argon / 6 TG / 12 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	3.14E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	3.14E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	1.92E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	1.92E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	6.31	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	6.93E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES CONTRAFLAM LITE 90 (5/5) IGU: 6 TG / 12 Argon / 6 TG / 12 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	2.98E-3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	1.48E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	8.40E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS CONTRAFLAM LITE 90 (5/5) IGU: 6 TG / 12 Argon / 6 TG / 12 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	1.80	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

ENVIRONMENTAL IMPACTS CONTRAFLAM LITE 90 (5/5) IGU: 6 TG / 14 Argon / 6 TG / 14 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	1.54E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas. carbon dioxide. which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	3.26E-5	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons). Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	5.75E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production. heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	1.42E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients. and the associated adverse biological effects.														
Photochemical ozone Creation Potential (POCP) *kg Ethene equiv/FU*	3.72E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil ressources (ADP-elements) - *kg Sb equiv/FU*	7.71E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil ressources (ADP-fossil fuels) - *MJ/FU*	1.73E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources. thereby lowering their availability for future generations.														

RESOURCE USE CONTRAFLAM LITE 90 (5/5) IGU: 6 TG / 14 Argon / 6 TG / 14 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	3.18E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	3.18E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	1.94E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	1.94E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	6.31	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	7.03E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES CONTRAFLAM LITE 90 (5/5) IGU: 6 TG / 14 Argon / 6 TG / 14 Argon / CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	2.98E-3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	1.50E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	8.47E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS CONTRAFLAM LITE 90 (5/5) IGU: 6 TG / 14 Argon / 6 TG / 14 Argon /CF LITE 90 (5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	1.81	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

LCA results interpretation

In the production of CONTRAFLAM LITE 90 DGU: CFL (5/5) / 16 Argon / 4 Toughened, most of the impacts are linked to the glass production and CONTRAFLAM production with the integration of the intumescent interlayer.

CONTRAFLAM LITE 90 IGU is made of tempered glass and intumescent interlayer(s).
Most of the CO_2 emissions are linked to the glass production phase and the integration of the intumescent interlayer in the glazing.
Water consumption is linked to the electrical energy used for the transformation process of the glass and to the production of the intumescent interlayer.

		Environmental impacts (A1-A3) CFL 90-16-4T	Unit
	Global warming	1.11E+02	kg CO_2 equiv/FU
	Non-Renewable resources consumption[1]	1.24E+03	MJ/FU
	Energy consumption[2]	1.63E+03	MJ/FU
	Water consumption[3]	5.04E-01	m^3/FU
	Waste production[4]	1.27E+01	kg/FU

[1]: This indicator corresponds to the abiotic depletion potential of fossil resources.
[2]: This indicator corresponds to the total use of primary energy (renewable and non-renewable)
[3]: This indicator corresponds to the use of fresh net water.
[4]: This indicator corresponds to the sum of hazardous. non-hazardous and radioactive waste disposed.

Health characteristics

Indoor air quality

Clear flat glass is an inert material that doesn't release any inorganic & organic compounds - in particular, no VOC (volatile organic compounds).

The sealant of CONTRAFLAM 90 IGU is made of organic materials which have been tested regarding their VOC emissions (following ISO 16000 standard):

- Polysulfide: total VOC after 28 days < 38 µg/m3 (Eurofins report G07104)
- Polyurethane: total VOC after 28 days < 4 µg /m3 (Eurofins report G08363).

If the glass is laminated, a PVB layer is included in the glazing. The VOC emissions test (following ISO 16000 standard) rank the PVB A+ (highest rank) following the French regulation (Eurofins report G10504).

- Total VOC after 28 days < 200 µg/m^3
- Formaldehyde after 28 days < 10 µg/m^3

Additional Environmental Information

Disposal considerations

Disposal may be in accordance with local and national legal requirements for the disposal of glass waste. The local regulations for discharging waste water in sewage treatment plants must be taken into consideration for water-soluble material. In the EU, waste code 200102[7] is applied (Test report 66988008 Eurofins).

Saint-Gobain's environmental policy

Saint-Gobain's environmental vision is to ensure the sustainable development of its activities, while preserving the environment from the impacts of its processes and services throughout their life cycle. The Group thus seeks to ensure the preservation of resources, meet the expectations of its relevant stakeholders, and offer its customers the highest added value with the lowest environmental impact.

The Group has set two long-term objectives: zero environmental accidents and a minimum impact of its activities on the environment. Short and medium-term goals are set to address these two ambitions. They concern five environmental areas identified by the Group: raw materials and waste; energy, atmospheric emissions and climate; water; biodiversity; and environmental accidents and nuisance.

Saint-Gobain's long term objectives:

	Non recovered waste (2010-2025): -50% Long-term: zero non-recovered waste
	Energy consumption: -15% (2010-2025) CO_2 emissions: -20% (2010-2025) Emissions of NOx. SO_2 and dust: -20% for each emissions category (2010-2025)
	Water discharge: -80% (2010-2025) Long-term: zero industrial water discharge in liquid form
	2025: promote the preservation of natural areas at Company sites as much as possible
	2025: all environmental events are recorded. registered and investigated

More information on our website: www.saint-gobain.com and our Registration Document.

Our products' contribution to Sustainable Buildings

Saint-Gobain encourages sustainable construction and develops innovative solutions for new and renovated buildings that are energy efficient, comfortable, healthy and esthetically superior, while at the same time protecting natural resources.

The following information might be of help for green building certification programs:

RECYCLED CONTENT

(Required for LEED v4 Building product disclosure and optimization - sourcing of raw materials)

[7] EWC code 200102 – glass – Absolute Non-hazardous

Recycled content: proportion (by mass) of recycled material in a product or packaging. Only pre-consumer and post-consumer materials shall be considered as recycled content.

- Post-consumer material: material generated by households or commercial, industrial and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose.

- In practice, in the case of flat glass, all material coming from glass recycling collection schemes falls under this category, i.e. glass waste from end-of-life vehicles, construction and demolition waste, etc.

- Pre-consumer material: material diverted from the waste stream during a manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

- In the case of flat glass, this waste originates from the processing or re-processing of glass that takes place before the final product reaches the consumer market. Pre-consumer waste flat glass is made of cut-off, losses during laminating, bending and other processing, including the manufacture of insulating glass units or automotive windscreens.

Cullet generated in the furnace plant and which is reintroduced into the furnace cannot be considered as pre-consumer recycled content, since there was never intent to discard it and therefore it would never have entered the solid waste stream.

Pre-consumer cullet	~7%
Post-consumer cullet	< 1%

In the future, Saint-Gobain Glass intends to continue the increase of recycled material in its products, especially when recycling building post-consumer cullet glass dismantling and recycling networks will be available in every country.

RESPONSIBLE SOURCING

(Required for BREEAM International new construction 2013 – MAT 03 Responsible sourcing)

Romont (Switzerland) and Namyslow (Poland) Vetrotech Saint-Gobain factories are certified ISO 14001. Kinon Aachen (Germany) is certified ISO 50001 (Energy management).

All Saint-Gobain Glass Industry sites with a glassmaking furnace, are ISO 14001 certified.

All internal Saint-Gobain Glass quarries are certified ISO 14001 like for example SAINT-GOBAIN SAMIN (sand) in France. Many Saint-Gobain Glass raw material suppliers are certified ISO 14001. Our policy consists in encouraging the sourcing of raw materials extracted or made in sites certified ISO 14001 (or the equivalent).

References

EN 15804 + A1(2013) – Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction product.
PCR 2012:01 Construction products and construction services, version 2.3 2018-11-15
GPI 3.0 - GENERAL PROGRAMME INSTRUCTIONS FOR THE INTERNATIONAL EPD® SYSTEM
EN 410 - Glass in building - Determination of luminous and solar characteristics of glazing
EN 1363-1 - Fire resistance tests - Part 1: General Requirements
EN 1363-2 - Fire resistance tests - Part 2: Alternative and additional procedures
EN 12758 - Glazing and airborne sound insulation - Product descriptions and determination of properties
EN 13501-1 - Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
EN 13501-2 - Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests, excluding ventilation services
EN 13823 - Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item
EN 14449 - Glass in building - Laminated glass and laminated safety glass - Evaluation of conformity/Product standard
EN 15998 - Glass in building - Safety in case of fire, fire resistance - Glass testing methodology for the purpose of classification